ENERGY TECHNOLOGY ENGINEERING CENTER

OPERATED FOR THE U.S. DEPARTMENT OF ENERGY
ROCKETDYNE DIVISION, ROCKWELL INTERNATIONAL

No. SSWA-ZR-0003 Rev. ___
Page 1 of 7
Orig. Date 3/22/96
Rev. Date ___

DRR 25460

TITLE: **Sampling and Analysis Plan for T064 and Related Areas**

- APPROVALS -

Originator	R. J. Tuttle 3/22/96	ETEC QA	S. E. Reeder 3/29/96
ETEC Proj. Mgr.	P. S. Olson 3/25/96	Enviro Rem	P. D. Rutherford 4/2/96
ETEC Prog. Mgr.	M. E. Lee	Enviro Rem	B. M. Oliver

REV. LTR.	REVISION	APPROVAL/DATE

1. Objective

Determine the significant radionuclides and define the extent of contaminated exterior areas at Building T064 and the adjacent related areas.

2. Introduction

Radioactive contamination exists in the soil of the T064 Side Yard, generally to the east of the facility paved area, and in soil on the far side of G Street from the driveway to T064. The contamination is scattered throughout this area, with some hotspots. Soil areas that have radioactivity both above and below the anticipated acceptable concentration limits exist around and through the Side Yard. The major contaminant is Cs-137, but Sr-90 and uranium isotopes must also be considered to be present, and some samples must be analyzed for these radionuclides. Analysis of selected samples should include tritium, thorium, and plutonium, to provide a basis for elimination of these from further consideration.

It is the intention of this sampling and analysis program to define the extent of the contamination, both above acceptance limits and above background, to permit selective removal of contaminated soil in a way that reduces waste disposal costs, minimizes overall costs, and assures compliance with regulatory acceptance release criteria. Detailed analysis will permit establishing an average ratio of minor contaminants to Cs-137 activity for the characterization of waste packages.

3. Facility Description

The area of concern in this survey plan consists of the land sloping downward to the east of the paved area of T064, extending across G Street to the dirt road at the base of the rock outcropping. This region is shown in Figure 1. The history of this area and the record of earlier cleanup efforts is contained in the referenced documents (Ref. 1-5).

The pavement facing the building and covering the driveway is cracked and has been partially removed along the previous excavations in the northern dirt area. The driveway is irregularly cracked and is crossed near the top by a trench cut for a sewage drainage line, which was backfilled and repaved. The start of this backfilled trench, in the dirt area, is associated with a residual hotspot. A secondary trench, backfilled and repaved, crosses this trench in a direction from the building, ending on the far side of the larger trench. The sewage line is in place from near the septic tank inlet, and extends southeastward. The sewage line from the building is in place from the building to the edge of the broken pavement.

The septic tank discharge line was removed during work in January 1996, but the continuation to the leach field was not found at that time. The septic tank is in place, and the distribution box, the distribution lines, and the gravel bed have also been located.

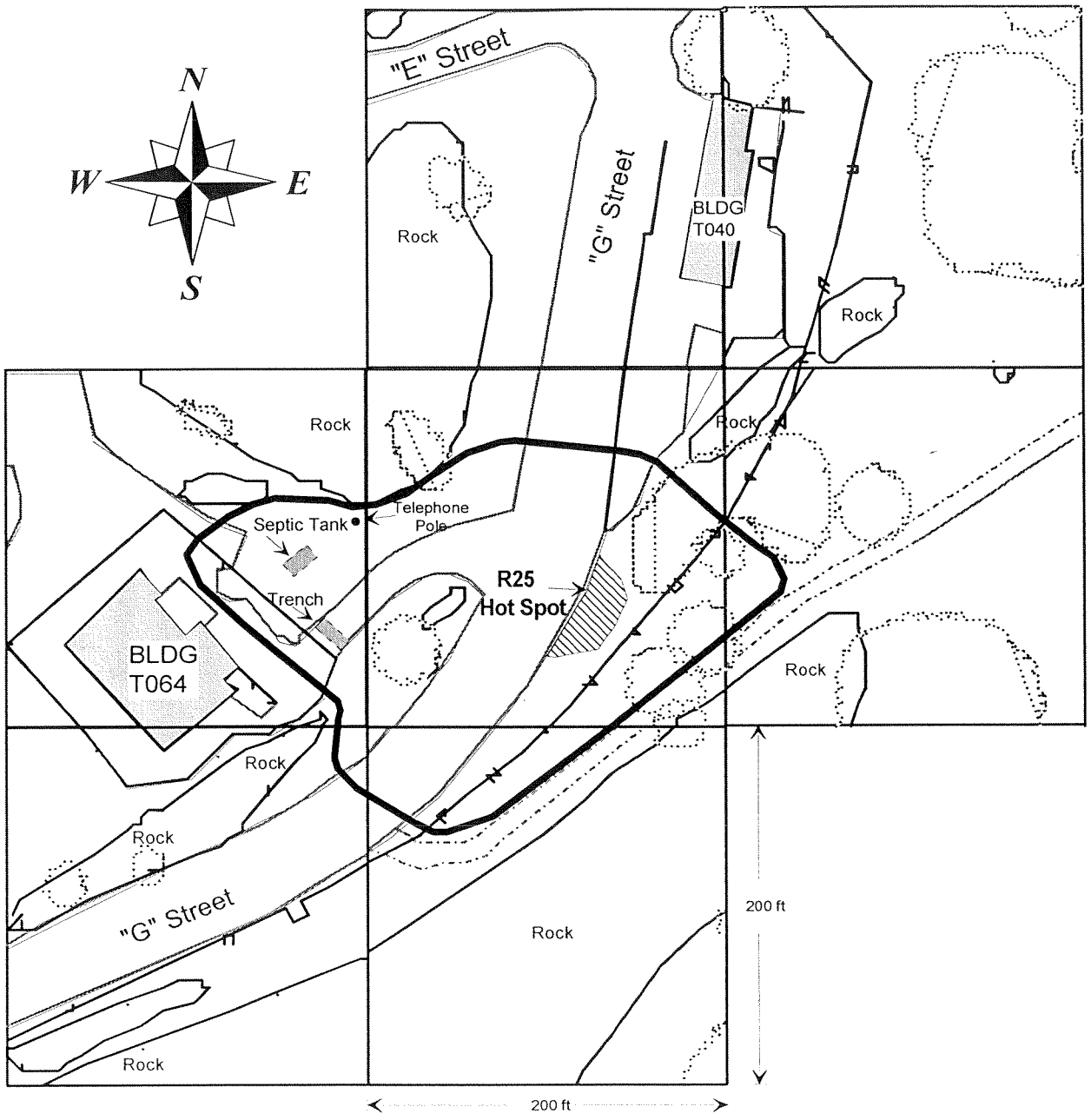

Figure 1. Location of contaminated soil associated with the T064 Side Yard

Soil contamination, consisting of Cs-137 with traces of Sr-90 (as found by the ORISE analyses of soil samples), has been found and largely remediated in the northern area, generally identified as the T064 SideYard. Similar contamination has also been found in the eastern section, on the east side of G Street in the center of Figure 1, known as the R25 hotspot, and has also been largely removed. A reasonable explanation of the origin of the contamination on the

east side of the road (G Street) has not yet been determined. A hotspot was found in the southern area, between the T064 driveway and G Street. An indication of possible contamination by enriched uranium was found in the outlet of the septic tank, by the detection of U-234, without a comparable activity of Th-234 and Pa-234m. This indication is somewhat uncertain, since the Th-234 activity suggests an enrichment of 15%, which is not like any material we worked with, and the U-235 activity is too low. Therefore, radiochemistry with alpha spectrometry is needed to resolve this issue. A slightly increased gamma exposure rate was found in the southern section between the end of the ditch crossing the driveway and the oak tree. A single telephone pole intrudes in the northern section. Since this pole only provides telephone support to Building 040, which is scheduled for demolition, this pole and its stabilizing guy wire could be removed.

Surface drainage parallels G Street along the side near T064, and flows to the northeast. Drainage from the southern area passes through a conduit under the driveway at its connection to G Street. This drainage continues through a conduit under G Street at the junction with E Street, shown at the top of the figure. This conduit discharges to surface drainage south of E Street and east of G Street. This surface drainage path flows southeast. The terrain slopes down from T064 to this drainage, and slopes away from the far side of G Street, through the eastern section.

Considerable soil removal has been done in the northern (T064 SideYard) and eastern (R25) sections and these areas are very uneven. The subsoil is sandy to sandy/cobbly, with some lenses of clay. The balance of the area consists of moderately steep slopes, covered more or less with grass and brush. Some large shrubs and oak trees are present. There are several small to large rock outcroppings

4. Analytical Considerations

Cs-137 in soil samples can be easily detected by use of the XRHPGe gamma spectrometer at T100. The Minimum Detectable Activity (MDA) for a 7,000-sec count is 0.02 pCi/g. (The MDA is the activity that will be detected 95% of the time that a measurement is made.) The proposed acceptable concentrations for Cs-137 and Sr-90 at SSFL (Ref. 6) are 8.6 and 24 pCi/g, respectively. Based on the ORISE analyses of soil samples from the Side Yard (Ref. 5), the Sr-90 is likely to be less than 1% of the Cs-137 activity. For the expected levels of Cs-137, less than a few hundred pCi/g in the most contaminated soil, this Sr-90 activity is not noticeable in the spectrometer display.

For U-234, the greatest activity in highly enriched uranium, the MDA is on the order of 20 pCi/g. The proposed acceptable concentration for U-234 is 30 pCi/g, which is just above the practical MDA of the T100 gamma spectrometry detector. For accuracy and identification of isotopic activities, the characterization of uranium contamination will require use of alpha spectrometry at an outside laboratory.

In an ordinary extended workday (6:00am - 4:30pm), it is practical to run 6 samples on the gamma spectrometer, for 7,000-sec counts. Full interpretation of the 6 collected spectra can be

done, using SAMPO 90, in about 1 hour, the next day. This provides information on significant other contaminants and QC data for the integrity of the results.

The gamma spectrometry analysis can be effective for the scoping study needed to identify the extent of the contamination, but is inadequate for the detailed characterization of the soil for disposal. Detailed knowledge of the contamination can also be used in interpretation of the final survey results, after remediation is completed. Detailed analysis will require that samples be sent to an outside laboratory, such as Teledyne or DataChem, for gamma-spec, Sr-90, and U-ISO. This can be done on a small number of selected representative samples. Samples should be taken for analysis for tritium, in the southern section, the northern section, and in the eastern section. Some additional analyses for Th-ISO and Pu-ISO may be useful in showing the (expected) absence of these contaminants.

5. Sampling Approach

This survey will be done in sequential stages until adequate data have been obtained to provide the needed characterization of the contamination.

5.1 Lateral Boundaries

An estimated approximate outside boundary has been drawn in on the map of Figure 1, and can serve to guide the initial search for the real boundary. This estimated boundary will be improved by a walk-about survey with the NaI gamma detector at ground level. The surveyor will determine local background to identify detected activity above background as an indication of contaminated soil.

This defined boundary will be marked by rope staked to the ground, with adequate slack to permit easy movement as the boundary is better defined.

The initial sampling sequence will consist of 6 samples, which is a reasonable throughput for the T100 gamma spectrometer (this number is subject to revision based on the constraints presented in the Analytical Considerations section), spaced along the estimated boundary at approximately 150-foot intervals. These samples will be analyzed by gamma spectrometry, concurrent with the collection of the second set of samples. The second set will be collected along the previously estimated boundary, approximately midway between adjacent sample locations in the first set.

Information from the gamma analysis of the first set of samples will be used to adjust the estimated boundary, outward or inward as determined by the samples showing contamination or not. The distance of this adjustment may be chosen by the surveyor, but should probably not exceed 5 feet at a time.

Additional sets of samples (6 samples for each set) will be taken by progressing around the adjusted boundary, starting at an intermediate point between the existing sampled locations, until

the outer extent of the contaminated areas is established. Locations where the boundary is well established by previous sample analyses may be skipped in subsequent samplings. It is estimated that the boundary may be defined to within about 3 feet by the data from 5-10 sampling sets.

Samples should be taken along the drainage paths in both directions.

5.2 Vertical Extent

The vertical extent of the contamination will be investigated by gamma spectrometry of soil samples taken at different depths at specified locations. These samples will be taken at uniform spacings along lines established across each defined area. The spacing will be chosen to provide reasonable spatial resolution for the profile, and to assure that major excursions of contamination are not missed. Samples will be taken in 6-inch increments of depth, taken from side-by-side holes in pairs as needed to fill a Marinelli beaker. This will be done initially to a depth of 2 feet, however, exploration of the soil below the leachfield will require much deeper sampling. This is probably best done after removal of the leachfield gravel. The sample holes will be protected, by wooden covers or by PVC pipe inserts or a similar method, so that further samples can be taken if activity is found in the lowest samples. The soil below the lower end of the leach field should be sampled to depths below the horizon of the contamination found on the east side of G Street.

5.3 Sampling Procedure

Soil samples will be taken for the boundary search by use of the power auger with a 2-inch bit, drilling 2 feet deep. The soil will be collected by drilling through a close-fitting hole in the bottom of a plastic tray, mixing the soil ejected into the tray by the auger, and pouring into a Marinelli beaker. The power auger provides samples quickly, but with poor vertical definition. The location of each sample will be determined based on the 200-foot grid system established for the Area IV Characterization Survey. Point locations should be recorded to the nearest foot.

Soil samples will be taken for estimation of the vertical extent by use of a hand coring auger to extract samples for gamma spectrometry. Each barrel-load of the auger represents approximately a 6-inch depth in the soil, and 2 loads are required to fill a Marinelli beaker. Concurrent coring in two adjacent holes, with samples taken at the same depth, will provide the needed sample mass and permit definition of vertical extent within 6 inches. The hand auger is slower, but is capable of sampling more precisely than the power auger.

6. Data Interpretation

Analytical results will be inspected as they are produced by use of CumPlot. This will indicate the practical division between background and contaminated soil.

The quantitative search for the boundary will produce numerical values for the Cs-137 concentration at locations defined by northing and easting coordinates. This permits use of the

survey interpretation program ContourPaint. Concurrent entry of the analytical data into this program will provide guidance as to where the boundary is most likely to be and what areas have inadequate data to permit a decision. This program will be set to display the regions expected to be above a chosen value, and above a value above the upper range of background, such as 0.5 pCi/g Cs-137.

7. Time Requirements

Initial definition of the boundary by means of the walkabout survey will take about 3 days. Collection of 10 sets of 6 each of soil samples will take about 2 working weeks. Determination of the vertical extent by core drilling will take about 3 days. With completion of data analysis and preparation of the report, this plan will require about 4 calendar weeks.

8. Documentation

A brief characterization report will be prepared. This will include all analytical results, with a revision when the outside laboratory results are received. Maps showing the boundary as defined for activity above the acceptable limit and above background will be presented. Cross-section views of the vertical extent will be shown.

9. References

1. "Radiological Survey of the Source and Special Nuclear Material Storage Vault-Bldg. T64", GEN-ZR-0005, 8/19/88

2. "Building 064 Soil Decontamination", N001DWP000023, 7/31/89

3. "Final Decontamination and Radiological Survey of the Building T064 Side Yard", N704SRR990031, 9/10/93

4. "Building 064 Side Yard Survey", Letter 93ETEC-DRF-0764, 4/29/93, G. G. Gaylord to D. Williams

5. "Verification Survey of the Old Conservation Yard, Building T064 Side Yard, and Building T028 , Santa Susana Field Laboratory, Rockwell International, Ventura County, California", ORISE, October 1993

6. "Proposed Sitewide Release Criteria for Remediation of Facilities at the SSFL", N001SRR140127, 3/11/96